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ABSTRACT

To maintain the legacy of freedom from the Age of Enlightenment, educators must effectively teach about the interrelated ideas of modern science and constitutional democracy in both social studies and science courses. The United States most directly and fully exemplifies the civic and scientific ideas which have developed as a result of the Age of Enlightenment. The free practice of modern science is guaranteed only in free societies; and only in those societies are the full benefits and power of modern science likely to be experienced. Educators in the sciences and social studies have been proposing an emphasis on science/technology/society in the core curriculum of secondary schools. The National Assessment of Educational Progress (NAEP) and other studies of student achievement reveal generally low levels of student knowledge about society and values related to scientific inquiry in a free society. Inadequate treatment of science and free government in the curriculum and the classroom is likely to impede education for citizenship in a free society. Educators should expand coverage of science in both United States history and world history and portray science and democracy as the most revolutionary pair of ideas in modern history. There is a need to develop a reasoned commitment among students to the interrelated ideas of scientific inquiry and constitutional democracy, which together define civilization. (SM)

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John J. Patrick

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CONNECTING SCIENCE AND FREE GOVERNMENT IN CITIZENSHIP EDUCATION: TEACHING ABOUT OUR LEGACY FROM THE AGE OF ENLIGHTENMENT

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This year, 1987, we have been celebrating one of the world's great success stories--the 200-year life of our venerable Constitution--the oldest written constitution and perhaps the most innovative and influential set of ideas ever cast in one frame of government. From time to time, however, Americans have worried about--even doubted--the continuity of our experiment in free government launched so boldly in 1787.

For a moment, let us go back in time, to a day more than fifty years ago, 20 January 1937, when the future looked less bright than it does today. A driving rain pounded the steps of the nation's Capitol, and a bitter wind chilled the thousands who gathered there. The occasion was President Franklin Delano Roosevelt's second inaugural address. Although the weather was inclement and times were troubled, this audience was buoyant; they expected to be inspired and lifted by their President, and they were not disappointed.

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Despite current problems--the continuing depression at home and the threats of hostile dictators abroad--President Roosevelt spoke optimistically about the future; he emphasized two interrelated ideas as foundations of past achievements and of future ambitions. He said: "Science and democracy together offer an ever-richer life and ever-larger satisfaction to the individual. . . . We have set our feet upon the road of enduring progress."

According to President Roosevelt, the interrelated ideas of science and constitutional democracy--legacies from our Founding Fathers--were keys to better times ahead. He implored Americans to maintain their faith in science and free government and to keep these ideas in tandem, as interlocking parts in the foundations of their civilization.

What are the core connections of science and free government that meant so much to President Roosevelt fifty years ago? Do these connections have meaning for us today, especially for those of us interested in education about science and technology in society and in cultural literacy among all groups of Americans? Are we acting to preserve the interlocking ideas of science and free government through secondary school education in science and the social studies? If not, how should we act so that these revolutionary ideas retain their vitality and continue to guide us?

Connections of Science and Free Government

A first step in examination of connections between free government and science is to briefly review the meaning of these two ideas. Free government--according to our Founding Fathers who established it through the Constitution of 1787--is popular and energetic government, based on majority rule, which is also strictly limited by the rule of law, so that the civil liberties and rights of all persons, including unpopular individuals and minority groups, will be protected. Of course, the Founding Fathers' concept of free government is known today as constitutional democracy (as distinct from the classical idea of democracy which Aristotle and others considered a corrupt form of government, because it produced majoritarian tyranny).

Modern science, emanating from an intellectual revolution of the 16th century, is a way of thinking and knowing based on new and evolving public standards of reliability and validity; it is a method of inquiry that combines rigorous theoretical analysis of specified properties with scrupulous empirical testing of that analysis. Both modern science and free government were and are opposed to arbitrary authority or tyranny of any kind, and both have embodied the authority of human reason, freely exercised, and guided by humane values. Indeed the free practice of modern science is guaranteed only in societies with free government; and only in those societies are the full benefits and power of modern science likely to be experienced.

Both free government and modern science, of course, are products of a remarkable period of European history, from the 16th through the 18th centuries, which culminated in the Age of Enlightenment. And it was during that great Age of Enlightenment, both in Europe and America, that the concepts and values of free government and science were inextricably connected. Eighteenth-century America, however, was the single living laboratory for a bold experiment in government and national development, which has continued until today.

America was created, willed into existence, when the Enlightenment was at high tide; and among all the nations of the world, the United States of America most directly and most fully exemplifies--in its Constitution and public institutions--civic and scientific ideas from the Age of Enlightenment. One of our greatest historians, Henry Steele Commager, eloquently expresses this theme: ". . . the Old World imagined the Enlightenment and the New World realized it. The Old World invented it, formulated it, and agitated it: Americans absorbed it, reflected it, and institutionalized it."

The United States of America, child of the Enlightenment, was founded on values of science, freedom, and rationality, which the philosophes of Europe and America taught. Among the Founding Fathers, Jefferson and Franklin were philosophers, statesmen, and scientists; and most of the others had great

faith in the use of reason, based on science as a way of thinking and knowing, to solve problems in government and society. These Enlightenment values were memorably proclaimed in our Declaration of Independence and emphatically embedded in our novel Constitution and Bill of Rights, by which we Americans established the first new nation of our modern world.

Unlike the old nations (France and England, for example) we were NOT joined together by kinship, tribal associations, or traditional ties to territory; our bonds of nationhood have little to do with "blood and soil." Instead, our ties were and are based primarily on shared beliefs about the nature of government and society, the primacy of reason in responding to challenges of choice, and the inalienable rights of individuals. Furthermore, core ideas of our common American culture include freedom of the mind and humanism--the open and unfettered use of reason to serve human needs and wants through the improvement of human societies.

Thomas Jefferson expressed commitment to these values and their potential for grounding a common American culture, "I have sworn upon the altar of God, eternal hostility against every form of tyranny over the mind of man," said Jefferson. And, in words presaging the second inaugural address of our thirty-second President, our third President linked freedom with science: "Great fields are yet to be explored to which our

faculties are equal, and that to an extent of which we cannot fix the limits. . . . While the art of printing is left to us, science can never be retrograde; what is once acquired of real knowledge can never be lost. To preserve the freedom of the human mind then and freedom of the press, every spirit should be ready to devote itself to martyrdom. . . . That the enthusiasm which characterizes youth should lift its parricide hands against freedom and science would be such a monstrous phenomenon as I cannot place among possible things in this age and this country."

Science, Free Government, and Cultural Literacy

The paired ideas of science and constitutional democracy, celebrated in different centuries by two great Presidents, Jefferson and Roosevelt, have critical importance for educators today, as we consider challenges of curriculum reform; because these intertwined ideas, and all that they denote, are core components of cultural literacy for all individuals of our contemporary society. E.D. Hirsch argues that "To be culturally literate is to posess the basic information needed to thrive in the modern world." Furthermore, Hirsch argues, and I agree, that cultural literacy--knowledge of key facts and ideas of a human community--should be the outcome of a sound education in the schools of that community. If so, the community will endure and those within it who are culturally literate will be empowered to succeed on its terms.

If there is a common culture of our American nation (and I believe that there is one), it includes most basically core concepts and values about free science and free government, our inheritance from the Age of Enlightenment. And if these ideas fail to define us as a people and a nation, then we have no justifiable national definition and are merely a loose collection of groups and detached individuals, occupying the same space, but without a collective purpose that points the way to a bright future.

Of course, I emphatically reject the viewpoint that we lack a coherent national identity grounded in common civic beliefs--embedded in our Constitution and public institutions--which give coherence and unity to our American culture and nationality. However, I do entertain the idea that this common culture, especially the elements based on knowledge of and commitment to free science, may be at risk. And I accept the proposition that a large proportion of young Americans are failing to learn the core concepts and values of science in conjunction with free government that are among the most important intellectual legacies that we have. Thus, these young Americans are less than culturally literate, to their immediate disadvantage and to the peril of the culture that may not survive a generation that fails to know and value it. What evidence do we have that educational neglect is contributing to gross cultural illiteracy with respect to the interrelated ideas of science and democracy?

Evidence of Neglect in Education on Science and Free Government

Educators in the sciences and social studies have been proposing emphasis on science/technology/society in the core curriculum of secondary schools. We have been calling for attention to the history of science and to science-related social issues in both social studies and science courses. In particular, some of us have been urging curriculum developers and teachers to treat in tandem the revolutionary ideas of science and democracy and their powerful effects in shaping the modern world.

But these recommendations, although trendy, have not become trends in curriculum development and classroom practices. There is a large discrepancy between new goals of educational leaders and common classroom realities as indicated by various assessments of student knowledge and attitudes and of textbooks and other curriculum materials. In particular, the neglect of science in most social studies courses seems greater than the neglect of science-related social concerns in most science courses.

Assessments of Learning. The National Assessment of Educational Progress (NAEP) and other studies of student achievement reveal generally low levels of student knowledge about science and society and values related to scientific inquiry in a free society. In particular, there appears to be

gross ignorance and lack of awareness of science-related social issues.

The most recent study by NAEP, a national assessment about history, reveals that nearly sixty percent of our 17-year-olds lack basic knowledge about our nation's past; in particular, they are ignorant of key facts in constitutional and political history and in the history of science. The authors of a recent book based on the national assessment of knowledge in history conclude, "The system by which we govern ourselves is comprehensible only if its history is understood. . . . Moreover, many of the most profound issues of contemporary society [including science-related social issues] . . . have their origins and their defining events in the evolving drama of the Constitution. Yet, our youngsters do not know enough about that drama to reflect on or think critically about it."

We can only guess about the knowledge that high school students have concerning origins and connections of science and democracy, because the recent national assessment of knowledge in history did not address this facet of our heritage. I suspect, however, that most of our students have reached only the lowest levels of cultural literacy with respect to the dynamic interplay of science and free government and the various ramifications of this pair of ideas in our history and contemporary society.

Assessments of Curriculum Materials. Student ignorance of science in history and current events undoubtedly is related to lack of coverage of this theme in textbooks and other curriculum materials. Recent studies of textbooks and curriculum guides in American history and world history, for example, reveal sparse coverage of science in history.

In general, the textbooks neglect the history of ideas and their effects on social developments. In particular, there is a tendency to overlook science as an idea that has profoundly shaped societies and generated massive social change. Of course, standard textbooks are filled with phrases about democracy, but treatments of democratic ideals tend to be superficial and disjointed. This claim is documented in a recent study of world history textbooks pointedly titled, "Democracy's Untold Story: What World History Textbooks Neglect."

These deficiencies of high school history textbooks are also characteristic of textbooks and courses throughout the social studies curriculum, from the elementary school through the high school. Topics about science in society--especially the connections of science and democracy--have not become prominent in mainline social studies courses--American history, government, civics, world history, geography--where they could be related directly to traditional course content and goals.

Concluding Recommendations

Inadequate treatments of science and free government in the curriculum and the classroom are likely to critically impede fulfillment of the major purpose of social studies in the schools--education for citizenship in a free society. One can neither perceive contemporary events accurately, nor think effectively about them, nor act responsibly as a citizen in a modern democracy without knowing about science and free government in tandem as powerful cultural forces. What can educators do to remedy deficient treatments of science and free government in the curriculum and classroom?

First, we can expand coverage of science in American history and world history, and we can endeavor to portray science and democracy as the most revolutionary pair of ideas in modern history. We might use the words of the great British historian, Herbert Butterfield, to justify extensive and emphatic coverage of science in history: "The scientific revolution," writes Butterfield, is "a creative product of the West" and "it proved to be so capable of growth, and so many-sided in its operations, that it consciously assumed a directing role from the very first, and so to speak, began to take control of the other factors--just as Christianity in the middle ages had come to preside over everything else, percolating into every corner of life and thought. And when we speak of Western civilisation being carried to an oriental country like Japan in

recent generations, we do not mean Graeco-Roman philosophy and humanist ideals, we do not mean the Christianising of Japan, we mean the science, the modes of thought and all that apparatus of civilisation which were beginning to change the face of the West in the latter half of the seventeenth century."

Butterfield's statement certainly provides a powerful rationale for science in the history curriculum. But we need to do more than transmit knowledge of science in history and contemporary society, as a powerful agent of social change and generator of challenging social issues. We must also develop reasoned commitment among our students to the interrelated values of scientific inquiry and constitutional democracy, which together define our civilization. Let me emphasize that the intention is NOT mindless transmission of these values; rather, the goal is development of understanding that provides warrants for these ideals as powerful and potentially worthy forces in our lives.

But as we renew and improve education about science and democracy, we must also remember that reason and science alone are insufficient instruments of freedom; because they have been and can be used for inhumane ends. We must teach our students never to lose sight of a perennial question--"To what end?"--and to make judgments of ends in terms of the civic values of constitutional democracy.

Our greatest challenge in citizenship education today is to help young people understand and value the powerful partnership of science and democracy that President Roosevelt spoke about more than fifty years ago. Part of this challenge is to be ever-alert to contemporary forces that oppose both science and constitutional democracy, forces of nihilism that reject our legacy from the Age of Enlightenment. We cannot easily assume that our experiment in free government is everlasting, that it is invulnerable to the "monstrous phenomenon" that Thomas Jefferson could not imagine in his age and country--that "youth should lift its parricide hands against freedom and science."

If we would maintain our legacy of freedom from the Age of Enlightenment, if we would foster cultural literacy among all of our students, and if we would fortify our students against contemporary forces of un-reason, anti-science, anti-democracy, and nihilism, then we must effectively teach about the inter-related ideas of modern science and constitutional democracy in both social studies and science courses. If so, we will have made a strong start in justifying content on science/technology/society as a core component of citizenship education in elementary and secondary schools.

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